TITLE: EFFICACY EVALUATION OF METALOSATE ZINC AS LIQUID FOLIAR FERTILIZER FOR BANANA

FUNDING AGENCY: JOCANIMA CORPORATION
#42 Mahogany Road, Pilar Village
Las Piñas City, Metro Manila 1750, Philippines

RESEARCHER: Dr. Sergia P. Milagrosa
Agway Chemicals Corp
JP Avenue, Davao City
FPA Accreditation No.: PNT 247

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STUDY SITE: Panabo, Davao del Norte

Efficacy Evaluation of Metalosate Zinc as Liquid Foliar Fertilizer for Banana

Introduction

Macronutrients are those elements needed in large amounts by the crop, and large quantities have to be applied if the soil is deficient in one or more of them. Nitrogen (N), Phosphorus (P) and Potassium (K) are the 'primary macronutrients' and these form the basis of NPK fertilizer compounds. The 'secondary macronutrients' are Calcium (Ca), Magnesium (Mg) and Sulphur (S). Micronutrients are those elements required in very small quantities. Despite being needed in small quantities, micronutrients are essential for the overall performance and health of the banana plant and one of these is Zinc (Zn). Narrow pointed and chlorite young leaves, bunchy top crowns are the symptoms of zinc deficiency which is often falsely identified as BBTV by the farmers. Bunches developing on such plants have twisted fingers with prominent light green tip. These are rejects from the exporter point of view, thus losses is encountered. A new product from Albion Plant Nutrition, Utah, USA is here to help banana growers solve the zinc deficiency problem in their plantation.

Jocanima Corporation, a leading Filipino owned agrochemical Corporation in collaboration with Albion Plant Nutrition from Utah, USA, will introduce Metalosate Zinc liquid foliar fertilizer and its novel technology to the Filipino farmers. This will help farmers meet the soaring standards for crop production by improving crop growth, development and yield. Therefore, this study evaluated the efficacy of Metalosate Zinc Liquid Foliar Fertilizer on banana; evaluated the effect of different rate applications of Metalosate Zinc Liquid Foliar Fertilizer in combination with commercial fertilizers used in banana plantations; and generated the bioefficacy data to support the registration of Metalosate Zinc Liquid Foliar Fertilizer with Fertilizer and Pesticide Authority (FPA).

Methodology

The following treatments, method of application and number of cycles per cropping is shown in Table 1.

Table 1. Treatments, rate, frequency, and method of application of Metalosate Zinc used in this study

Treatment Number	Description	Rate of Metalosate Zinc (L/ha/cycle)	Frequency of Application of Metalosate Zinc (Cycles/Cropping)	Method of Application of Metalosate Zinc
T1	RR (no Metalosate Zinc)	-	-	-
T2	RR + 50% Metalosate Zinc	0.25	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T3	RR + 100% Metalosate Zinc	0.50	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T4	RR + 150% Metalosate Zinc	0.75	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T5	100% Metalosate Zinc	0.50	3	Foliar at shooting, 30 days after shooting and 60 days after shooting

The study started in January until last week of April 2015 in one banana plantation in Panabo, Davao del Norte. Test plants have uniform fertilization program except for Zinc foliar fertilizers. The cooperator plantation, does not allow the application of any foliar fertilizer due to possible phytotoxicity and RR alone with no Metalosate Zinc served as the standard check. Furthermore, the setting-up of No Fertilizer Application Treatment (T5), means no more additional basal application when Metalosate Zinc application started.

The convenient fertilizers were applied as practiced by the plantation such as urea as source of nitrogen, triple super phosphate as source of phosphorus, and muriate of potash as source of potassium. The rate of application of urea was 456 gms/hill/year. The rate of application of triple super phosphate was 282 gms/hill/year. The rate of application of muriate of potash was 425 gms/hill/year. Metalosate Zinc foliar fertilizer was applied three times; the first application was at shooting, second application at 30 days after shooting, and third application was at 60 days after shooting.

Plants at shooting were randomly chosen where the first application of Metalosate Zinc was done thru foliar application. There were five plants per replicate with a total of three replicates. The trial followed randomized complete block design.

Other practices like control of black sigatoka and weeding were strictly followed.

Results and Discussion

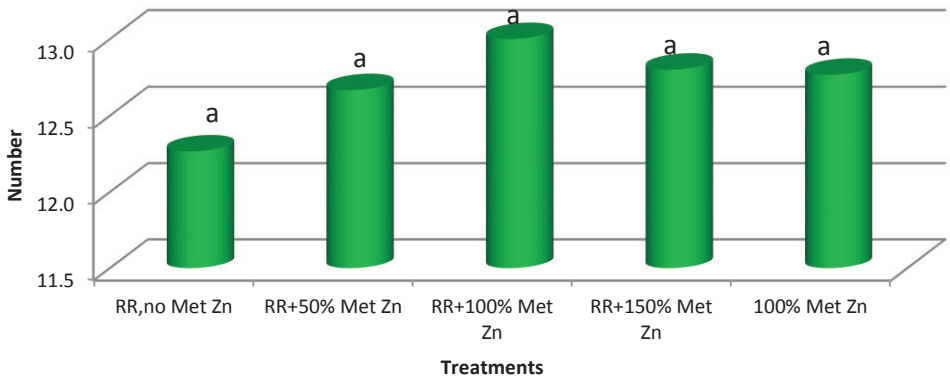
The number of leaves at shooting which coincides with the first application of the treatments is shown in Fig. 1 and Table 2. Leaves ranged from 12.3 to 13 per plant. This data served as baseline for further discussion in the number of leaves at harvest.

The age of fruits at harvest (Fig. 2 and Table 2) showed almost similar maturity in all the treatments. Metalosate Zinc (100%) without standard fertilization gave a little younger fruits at harvest but not statistically different from other treatments. This means that Metalosate Zinc did not adversely affect the maturity of the plant.

Meanwhile the number of hands/bunch was higher in RR + 100% Metalosate Zinc with an average of 10.4hands/bunch while RR alone without any Metalosate Zinc has 9.5hands/bunch (Fig. 3 and Table 2). Statistical analysis showed no significant differences among treatments however the numerical difference of 0.9hand means an additional 250 bunches/hectare or equivalent to 450 boxes/hectare. The increase in harvest could be due to the application of Metalosate Zinc. This raise in harvest is a meaningful and significant effect in the part of the grower.

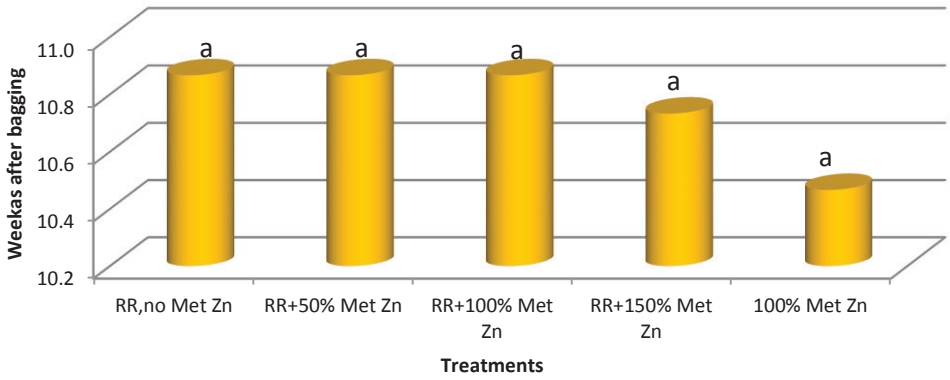
The highest bunch weight was recorded from plants with RR + 150% Metalosate Zinc or 0.75li/ha with 32.1kg and then followed by bunches from RR + 100% Metalosate Zinc or 0.5li/ha with 31.0kg (Fig. 4 and Table 2). The lowest weight of bunch was recorded from plants prayed with no Metalosate Zinc, with an average of 28.3kg weight per bunch. The additional weight of bunches in Metalosate Zinc-applied plants means less number of hands packed in a box.

Fig. 1. Number of leaves of banana plant at shooting as affected by Metalosate Zinc, Jan - Apr 2015, Davao del Norte, Philippines



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Fig. 2. Age of fruit at harvest as affected by Metalosate Zinc, Jan-Apr 2015, Davao del Norte, Philippines



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Fig. 3. Number of hands/bunch as affected by Metalosate Zinc, Jan-Apr 2015, Davao del Norte, Philippines

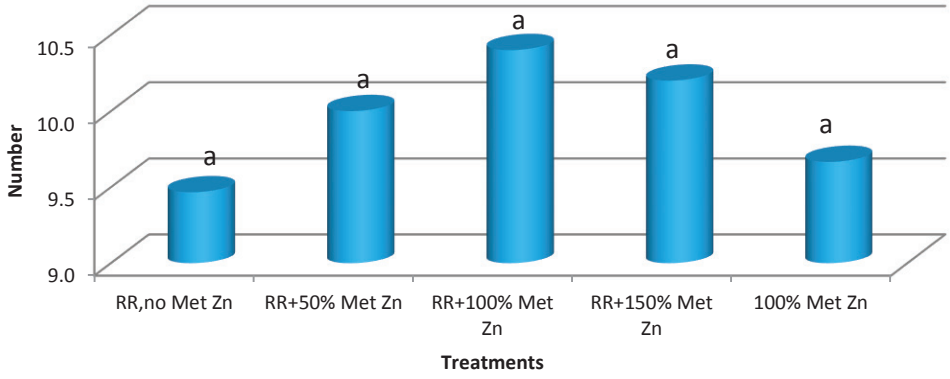


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Fig. 4. Bunch weight(kg) as affected by Metalosate Zinc, Jan-Apr 2015, Davao del Norte, Philippines

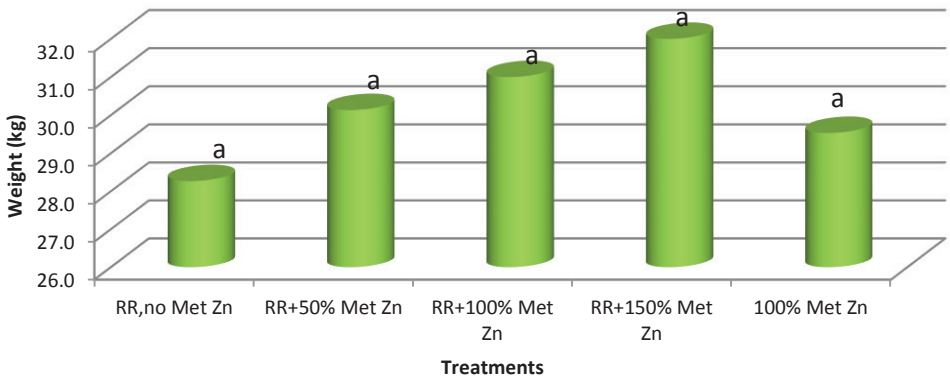

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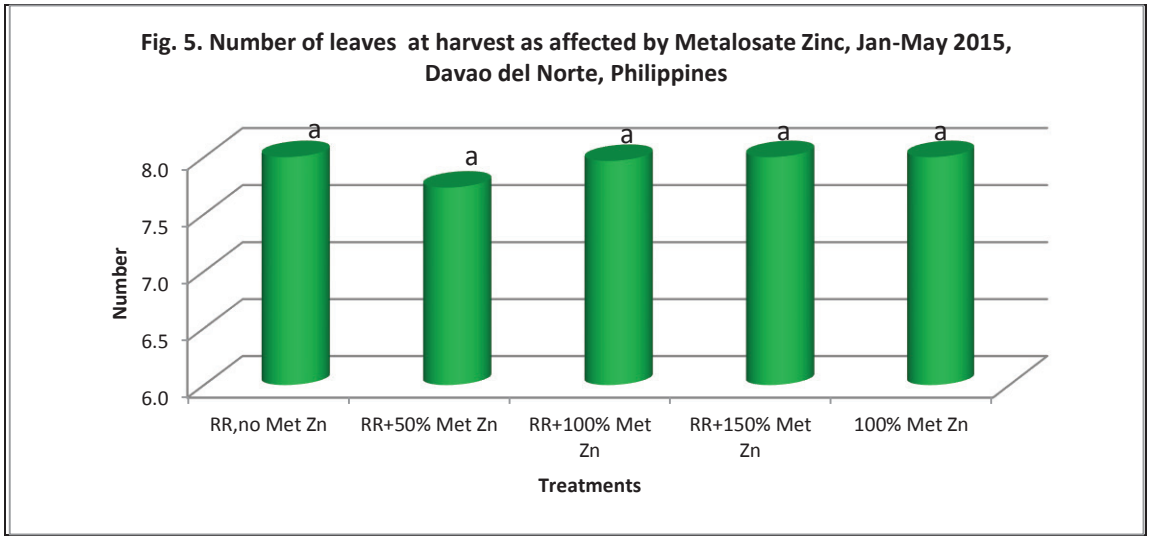
Table 2. Number of leaves at shooting, age at harvest, hands and bunch weight as affected by Metalosate Zinc[a]

Treatment Description	Number of leaves at shooting	Age at Harvest (weeks after bagging)	Average Number of Hands/bunch	Bunch Weight (kg)
RR (no Metalosate Zinc)	12.3a	10.9a	9.5a	28.3a
RR + 50% Metalosate Zinc	12.7a	10.9a	10.0a	30.1a
RR + 100% Metalosate Zinc	13.0a	10.9a	10.4a	31.0a
RR + 150% Metalosate Zinc	12.8a	10.7a	10.2a	32.1a
100% Metalosate Zinc	12.8a	10.5a	9.7a	29.5a

[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Fig. 5 and Table 3 showed the number of leaves of plants at shooting and at harvest. Plants applied with Metalosate Zinc lost one more leaf during harvest compared to the untreated but this did not affect negatively on yield.



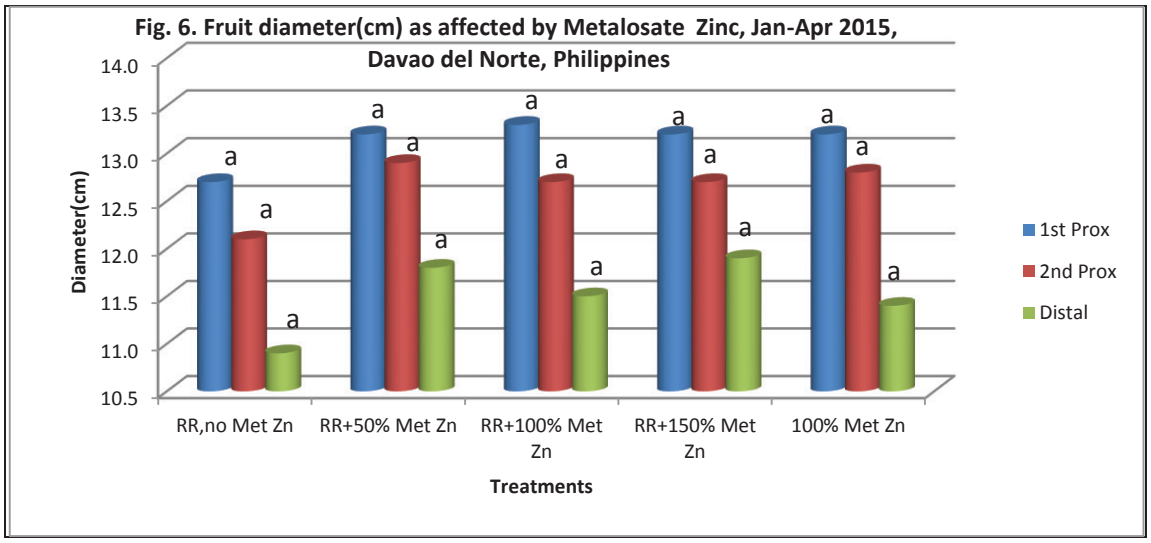
[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Table 3. The difference on number of leaves as affected by the treatment[a]			
Treatment Description	**Number of leaves at shooting**	**Number of leaves at harvest**	**Difference**
RR (no Metalosate Zinc)	12.3a	8.2a	4.1
RR + 50% Metalosate Zinc	12.7a	7.7a	5.0
RR + 100% Metalosate Zinc	13.0a	8.0a	5.0
RR + 150% Metalosate Zinc	12.8a	8.4a	4.4
100% Metalosate Zinc	12.8a	8.4a	4.4

[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Average fruit diameter from first proximal, second proximal and distal hands is shown in Fig. 5 and Table 4. Slight increase in fruit diameter was recorded on plants sprayed with Metalosate Zinc compared with RR alone, without any Metalosate Zinc. This could be the reason why there is an increase in yield of Metalosate Zinc-applied plants.

Fig. 6 and Table 4 showed the average length of fruits. The length of the first proximal was increased by RR + 150% Metalosate Zinc and the rest of the treatments gave similar data. The second proximal and distal hands are longer on Metalosate Zinc sprayed plants than without any Metalosate Zinc. If this could be due to the effect of the product, this is an excellent performance.



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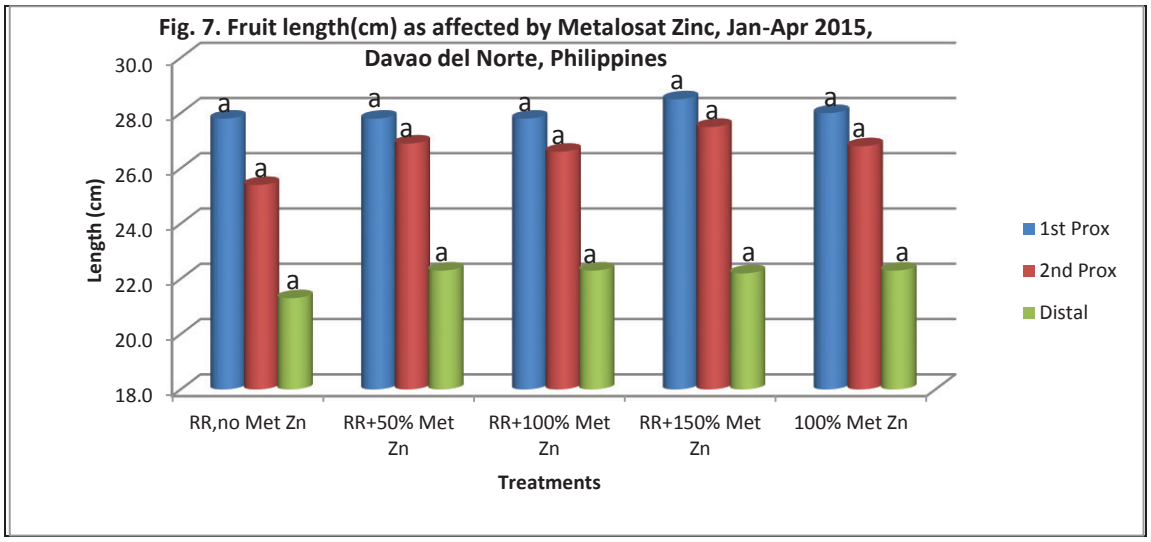


[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Table 4. Fruit measurements as affected by Metalosate Zinc [a]

	Diameter (cm)			Length (cm)		
Treatment Description	**First Proximal**	**Second Proximal**	**Distal**	**First Proximal**	**Second Proximal**	**Distal**
RR (no Metalosate Zinc)	12.7a	12.1a	10.9a	27.8a	25.4a	21.3a
RR + 50% Metalosate Zinc	13.2a	12.9a	11.8a	27.8a	26.9a	22.3a
RR + 100% Metalosate Zinc	13.3a	12.7a	11.5a	27.8a	26.6a	22.3a
RR + 150% Metalosate Zinc	13.2a	12.7a	11.9a	28.5a	27.5a	22.2a
100% Metalosate Zinc	13.2a	12.8a	11.4a	28.0a	26.8a	22.3a

Above results show that application of 0.25 and 0.5li/ha Metalosate Zinc at shooting, 30 days after shooting and 90 days after shooting, in addition to plantation practice fertilizer (RR) quantitatively provided more harvestable fruits and heavier bunches than unsprayed plants. Increase on bunch weight is directly related to number of exportable banana boxes (Table 4).

Table 5. Benefit-cost analysis for the application of 0.25 to 0.5l/ha of Metalosate Zinc over plantation practice.

Treatments	Bunch Weight (Kg)	Net Packable Wt. (Kg)	Wt. Difference Against SOP (Kg)	Box Stem Ratio	Exportable Boxe/ Ha/Yr	Boxes Gain/ Ha/ Yr	Gross Sales/ Ha/Yr (PhP)	Net Value of Gain/ Ha/ Yr (PhP)	% Gain	Peso Gain/ Peso Investment
T1. RR (Plantation SOP)	28.3	22.92	-	1.70	3,668	-	693,192	-	-	-
T2. RR + 0.25 L/Ha Metalosate Zinc	30.1	24.38	1.46	1.81	3,901	233	737,281	43,527	6%	77.38
T3. RR + 0.5 L/Ha Metalosate Zinc	31	25.11	2.19	1.86	4,018	350	759,326	65,010	10%	57.79

Notes:

1. Average population density of 2,000 hill/ has.
2. Average ratoon ratio of 1.2
3. Average total bunches/ha/year of 2160
4. Average fruit stalk of 10% of the bunch weight.
5. Average field loss of 10% of the net fruit weight.
6. Box weight of 13.5 kl/ bx.
7. A price per box of $4.2 @ Php45/ 1$.
8. Product was applied 3 cycles per cropping.
9. Estimated selling price of product is PhP 750/L

Wt. Difference against SOP	=	Net Packable Wt. of T2 – Net Packable Wt. of T1
Box Stem Ratio	=	Net Packable Wt. ÷ 13.5 Kg/Box
Exportable Boxes/Ha/Yr	=	Box Stem Ratio X 2,160 bunches/Ha/Yr
Boxes Gain/ Ha/Yr	=	Exportable Boxes/Ha/Yr of T2 – Exportable Boxes/Ha/Yr of T1
Net Value of Gain/Ha/Yr	=	[Gross Sales/Ha/Yr of T2 – Gross Sales/Ha/Yr of T1] – Cost of Product/Yr
% Gain	=	{[Gross Sales/Ha/Yr of T2 - Gross Sales/Ha/Yr of T1] ÷ Gross Sales/Ha/Yr of T1} x 100
Peso Gain/Peso Investment	=	Net Value of Gain/Ha/Yr ÷ Cost of Product/Yr

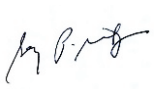
Conclusion and Recommendation

Metalosate Zinc at 0.25 and 0.5li/ha applied at shooting, and repeated 30 and 60 days after in addition to plantation practice fertilizer (RR) increased the number of hands and bunch weight at harvest. The increase in weight and length of fingers showed the value added performance of Metalosate Zinc in the production of quality export banana.

Metalosate Zinc at the rate of 0.25 and 0.5 liter product per hectare provided more exportable boxes of banana /ha, 3,901 and 4,018 boxes, respectively, compared to SOP of 3,668 boxes per hectare. The additional boxes from the application of Metalosate Zinc (0.25 and 0.5 l/ha) translates to incremental income of PhP 43,527 and PhP 65,010 per hectare per year. These mean that for every peso invested in applying Metalosate Zinc at 0.25 and 0.5 l/ha, we get a benefit-cost ratio of 77.38 and 57.79, respectively. These benefits can also be enjoyed by relatively small and independent banana growers.

Metalosate Zinc at 0.25 to 0.5li/ha is recommended for registration with the Fertilizer and Pesticide Authority.

Prepared by:



SERGIA P MILAGROSA
Fertilizer and Pesticide
Accredited Researcher, PNT 247